

DOCKET NO: 264737US0PCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :  
ANDREAS WOELFERT, ET AL. : EXAMINER: KATAKAM, S.  
SERIAL NO: 10/523,919 :  
FILED: FEBRUARY 7, 2005 : GROUP ART UNIT: 1621  
FOR: MODERATE-PRESSURE GAS :  
PHASE PHOSGENATION

APPEAL BRIEF

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VIRGINIA 22313

SIR:

This is an appeal of the Final Rejection dated September 17, 2010 of Claims 1-6 and 9-15. A Notice of Appeal was timely filed on December 17, 2010.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is BASF SE, having an address at 67056 Ludwigshafen, Germany.

II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative and the assignee are aware of no appeals, interferences, or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

### III. STATUS OF THE CLAIMS

Claims 1-6 and 9-15 stand rejected and are herein appealed. Claims 7-8 stand withdrawn from consideration.

### IV. STATUS OF THE AMENDMENTS

No amendment under 37 CFR 1.116 has been filed.

### V. SUMMARY OF THE CLAIMED SUBJECT MATTER

A summary of the claimed subject matter, as claimed in independent Claim 1, is mapped out below, with reference to page and line numbers in the specification added in **[bold]** after each element.

A process for preparing aromatic diisocyanate **[page 2, lines 7-8]** by reacting a phosgene with a diamine in the gas phase, **[page 2, lines 8-9]** wherein the reaction is carried out in a reaction zone in which the pressure is more than 3 bar and less than 20 bar **[page 2, lines 9-11]** and the temperature in the reaction zone is from more than 200°C to less than 600°C. **[page 4, lines 38-39]**

### VI. GROUNDS OF REJECTION

Claims 1-6 and 9-15 stand rejected under 35 U.S.C. § 103(a) as unpatentable over US 5,449,810 (Biskup et al.).

### VII. ARGUMENT

Claims 1-6 and 9-15 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Biskup et al. The rejection is untenable and should not be sustained.

As recited in Claim 1, an embodiment of the present invention is a process for preparing aromatic diisocyanate by reacting a phosgene with a diamine in the gas phase, wherein the reaction is carried out in a reaction zone in which **the pressure is more than 3 bar and less than 20 bar** and the temperature in the reaction zone is from more than 200°C to less than 600°C. (Emphasis added).

Biskup et al discloses a process for the preparation of aromatic diisocyanates by phosgenation of the corresponding diamines in the gas phase, wherein the reactants are mixed such that the flow of the gaseous reaction mixture is plug flow without back-mixing through a reactor, which is essential to the process of their invention (column 5, lines 5-7), which flow is ensured by a difference in pressure between the product feed pipes leading to a mixing aggregate and the outlet for a condensation step which occurs following the reaction (column 5, lines 7-11), wherein in general, the pressure in the feed pipes leading to the mixing aggregate lies within the range of from 200 to 3000 mbar, and the pressure downstream of the condensation step lies within the range of from 150 to 2000 mbar, and that it is essential that the pressure differential be maintained for the purpose of ensuring the stated directional flow (column 5, lines 11-18).

The Examiner finds that the pressure of the reaction medium is expected to be in between the pressure in the feed pipes and the pressure downstream in the condensation step, and concludes therefrom that “the pressure conditions in the claimed range and the prior art range are close enough (2-3 bar upper limit in the prior art versus 3 bar claimed lower limit) that one skilled in the art would expect them to have the same properties.” The Examiner then holds that the presently-claimed invention is *prima facie* obvious over Biskup et al.

In reply, Applicants agree that the pressure in the reaction zone in Biskup et al would be in between the pressure in the feed pipes and the pressure downstream in a condensation

step. However, Applicants do not agree that a minimum pressure herein of **more than 3 bar** is *prima facie* obvious over a pressure that is **necessarily less than 3 bar**. Moreover, the maximum pressure in any of the examples of Biskup et al is 820 mbar (column 6, line 7), which is substantially less than the minimum pressure of more than 3 bar herein. Clearly, Biskup et al provides **no** motivation to employ a pressure in their feed pipes leading to their mixing aggregate of more than 3000 mbar (3 bar), given the expected added expense in operating at an even higher pressure.

In addition, applying increased pressure leads to an increased space time yield and allows a production plant which contains very little phosgene, as described in the specification at page 1, line 39 through page 2, line 5. Due to the reduced space required by the gases at higher pressures, smaller devices can be used and a higher concentration in the gas phase can be achieved. A general disadvantage of higher pressures is that generally higher temperatures are needed to evaporate the amines used, which could lead to degradation of the amines. Therefore a person skilled in the art would have tried to reduce the temperature needed to evaporate the amines by reducing the pressure in the plant.

The present inventors have shown that by increasing the pressure in the plant, the above-described advantages as increased space time yield and a production plant which contains very little phosgene can be achieved but also, and surprisingly, the above-described disadvantages do not occur, i.e., the yield compared to Biskup et al has surprisingly not been reduced. This is borne out by comparing the presently-disclosed examples with those of Biskup et al. Thus, Example 1 and 2 from Biskup et al show a yield for toluene diisocyanate (TDI) of 99.3 % and 99.1%, respectively, at a pressure on the order of 0.8 bar, while present Example 1 shows a comparable yield for TDI at a pressure of 10 bar of 99.2 %. Similar results are obtained for methylenedi(phenyl isocyanate) (MDI). Compare Example 5 of

Biskup et al, which shows a yield of 99.1% at a pressure on the order of 0.6 bar, to present Example 2, which shows a comparable yield of 99.3% at a pressure of 5 bar. Such results could not have been predicted from Biskup et al.

In the Final Rejection, in response to the above arguments, the Examiner finds that Biskup et al “teaches all elements” of the presently-claimed process, and pressure difference “is not a [sic] huge.” In addition, the Examiner finds that the upper end pressure range of Biskup et al “overlaps” with the lower end pressure range of the present claims. The Examiner then holds that “design incentives or market forces” provide an obvious reason to adapt Biskup et al in making the present invention.

In reply, whether a difference in pressures is *not huge* is meaningless without taking the context into account. Nor is there overlap between the respective pressure ranges. As the Examiner admits that the pressure in the reaction zone in Biskup et al would be in between the pressure in the feed pipes and the pressure downstream in a condensation step, the maximum pressure in the reaction zone in Biskup et al would necessarily be **less than** the presently-recited minimum of more than 3 bar. Nor has the Examiner provided any evidence about design incentives or market forces. As discussed above, higher pressures would be expected to come with higher costs. Unless there is some reason to believe in advance that higher pressures will provide a benefit to offset such higher costs and expected disadvantages, one skilled in the art would not proceed on such a path. The Examiner has provided **no** reason.

In the Final Rejection, the Examiner finds that Applicants have failed to provide sufficient information in the form of comparative data in support of their argument that higher pressures lead to increased space time yield and a production plant which contains very little phosgene.

In reply, such data is not necessary, because Applicants do not challenge the fact that the above is expected. Indeed, as discussed above, a general disadvantage of higher pressures is that generally higher temperatures are needed to evaporate the amines, leading to their degradation. What is unexpected is that the above discussed disadvantages do not accrue.

The *Titanium Metals* case cited by the Examiner is inapposite, since there is no overlap in respective pressure ranges, as discussed above, and Biskup et al *as a whole* suggests operating at a pressure **much less** than 3 bar, such as of the order of 820 mbar.

Moreover, while it may ordinarily be the case that the determination of optimum values for the parameters of a prior art process would be at least prima facie obvious, that conclusion depends upon what the prior art discloses with respect to those parameters. Where, as here, the prior art disclosure suggests the outer limits of the range of suitable values, and that the optimum resides within that range, and where there are indications elsewhere that in fact the optimum should be sought within that range, the determination of optimum values outside that range may not be obvious. *In re Sebek*, 465 F.2d 904, 907, 175 USPQ 93, 95 (CCPA 1972).

#### Claim 9

Claim 9 is separately patentable, since the minimum of 3.5 bar recited therein is even further away from the maximum of **less than** 3 bar, and the maximum exemplified pressure therein of 820 mbar, disclosed therein.

#### Claim 10

Claim 10 is separately patentable, since the minimum of 4 bar recited therein is even further away from the maximum of **less than** 3 bar, and the maximum exemplified pressure therein of 820 mbar, disclosed therein.

Claim 11

Claim 11 is separately patentable, since the minimum of 5 bar recited therein is even further away from the maximum of **less than** 3 bar, and the maximum exemplified pressure therein of 820 mbar, disclosed therein.

For all the above reasons, it is respectfully requested that this rejection be REVERSED.

VIII. CONCLUSION

For the above reasons, it is respectfully requested that all rejection be REVERSED.

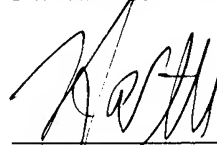
Respectfully submitted,

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CLAIMS APPENDIX

Claim 1: A process for preparing an aromatic diisocyanate by reacting a phosgene with a diamine in the gas phase, wherein the reaction is carried out in a reaction zone in which the pressure is more than 3 bar and less than 20 bar and the temperature in the reaction zone is from more than 200°C to less than 600°C.

Claim 2: A process as claimed in claim 1, wherein the temperature in the reaction zone is below the boiling point of said diamine under the pressure conditions prevailing in the reaction zone.

Claim 3: A process as claimed in claim 1, wherein an inert medium is fed into the reaction zone in addition to said diamine and said phosgene in such an amount that the concentration of inert medium at the outlet from the reaction zone is more than 25 mol/m<sup>3</sup>.

Claim 4: A process as claimed in claim 1, wherein the concentration of said phosgene in the reaction gas at the outlet from the reaction zone is more than 25 mol/m<sup>3</sup>.

Claim 5: A process as claimed in claim 1, wherein said process is carried out continuously.

Claim 6: A process as claimed in claim 1, wherein said process is carried out in a production plant wherein the phosgene holdup in the reaction zone for the reaction of said diamine with said phosgene in the plant is less than 100 kg.



Claim 9. A process as claimed in claim 1, wherein the pressure is from 3.5 bar to 15 bar.

Claim 10. A process as claimed in claim 1, wherein the pressure is from 4 bar to 12 bar.

Claim 11. A process as claimed in claim 1, wherein the pressure is from 5 bar to 12 bar.

Claim 12. A process as claimed in claim 1, wherein the phosgene and diamine reactants are fed through feed lines to a mixing device and then mixed in said device, followed by feeding the reactants to the reaction zone, and wherein the pressure in said feed lines is from 20 to 1000 mbar higher than the pressure in the reaction zone.

Claim 13. A process as claimed in claim 12, wherein the pressure in said feed lines is from 30 to 200 mbar higher than the pressure in the reaction zone.

Claim 14. A process as claimed in claim 1, wherein products leaving the reaction zone are fed to a work-up apparatus having a pressure that is from 50 to 500 mbar lower than the pressure in the reaction zone.

Claim 15. A process as claimed in claim 14, wherein the pressure in said work-up apparatus is from 80 to 150 mbar lower than the pressure in the reaction zone.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.